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Stability of Minkowski space in ghost-free massive gravity theory

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Abstract

The energy in the ghost-free massive gravity theory is calculated via explicitly resolving the initial value constraints for spherically symmetric deformations of flat space. It turns out that the energy is positive in some cases, but in other cases it can be negative and even unbounded from below. This could suggest that ghost instability is present. However, it seems that the negative energy states cannot communicate with the positive energy sector since the corresponding solutions of the constraint equations are either not globally defined, not asymptotically flat, or singular. As a result, they cannot describe initial data for the decay of flat space. At the same time, for globally regular and asymptotically flat solutions of the constraints, the energy is always found to be positive. All of this suggests that there is a physical sector of the theory where the energy is positive and the ghost is suppressed, so that the theory is stable. The negative energies show up only in disjoint sectors and thus should be harmless. © 2014 American Physical Society.

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